



DECLARATION OF WILLIAM W. STORMS, M.D.

I, WILLIAM W. STORMS, do solemnly and sincerely declare that:

I. BACKGROUND

1. I am Clinical Professor of Medicine at the University of Colorado Health Sciences Center, Denver, Colorado, U.S.A., and am a practicing allergist. Since 1997, I have been a member of the Sports Medicine Committee of the U.S. Olympic Committee. My *curriculum vitae* is attached hereto as Exhibit A.

2. I received a Bachelor of Arts degree from Northwestern University in 1964 and a Medical Doctor degree from the University of Wisconsin Medical School in 1968. I am board certified by the American Board of Internal Medicine and American Board of Allergy and Immunology. I interned at the San Francisco General Hospital, was a resident at the University of Wisconsin Hospital, and worked as a medical doctor at the Fort Carson, Colorado, U.S. Army Hospital. In 1975, I entered private practice, and since that time have focused on the treatment of asthma and related conditions.

3. I have given over 40 professional presentations, authored or co-authored over 50 publications, and authored or co-authored over 30 abstracts concerning asthma, allergic rhinitis and drugs used to treat these and related conditions. I have also conducted numerous clinical trials to determine the safety and efficacy of drugs such as albuterol and loratadine in the treatment of asthma and allergic rhinitis. I have prescribed loratadine to hundreds of patients, and am intimately familiar with its adverse effects.

4. In sum, I am an expert in the treatment of allergies and allergic rhinitis. I have first-hand knowledge of the safety and efficacy of various drugs used to treat these conditions and the problems faced by the pharmaceutical industry in developing new drugs to treat these conditions. I am particularly familiar with loratadine and other drugs related to it, and the serious adverse effects associated with them.

5. I have read International Application No. WO96/20708, which I understand corresponds to European Patent Application No. 95943722.9 ("the Patent Application"), and what I understand to be the claims currently pending in the Patent Application. I have also read the Decision to Refuse European Patent Application No. 95943722.9, dated September

8, 2000, the art cited therein, and additional art cited in connection with the Patent Application. In particular, I have read documents D1, D2, E1-E11 and E12-E23, which are identified in Exhibit B, attached hereto.

II. HISTAMINE-INDUCED PAW EDEMA EXPERIMENTS DO NOT PROVIDE INFORMATION SUFFICIENT TO DETERMINE WHETHER A COMPOUND WOULD BE EFFECTIVE IN THE TREATMENT OF ALLERGIC RHINITIS

6. In order for a compound to be effective in treating allergic rhinitis, it must be capable of selectively preventing histamine from binding to H₁ histamine receptors. Compounds with such a capacity are referred to as antihistamines or selective H₁ antagonists.

7. At least two additional types of histamine receptor are known to exist; they are referred to as H₂ and H₃ receptors. Drugs that selectively prevent histamine binding to these receptors are known as selective H₂ and H₃ antagonists, respectively. Selective H₂ and H₃ antagonists are not capable of preventing histamine from binding to H₁ receptors, and are therefore not useful in the treatment of the allergic conditions such as allergic rhinitis.

8. By December 30, 1994, which I understand is the earliest filing date to which the Patent Application is entitled, it was well known that a variety of compounds, many of which are not selective H₁ antagonists, reduce histamine-induced paw edema in rodents. For example, it was reported in document E12 that the selective H₂ antagonists cimetidine, ranitidine and loxidine reduce histamine-induced paw edema in rodents. Similarly, it was reported in document E13 that the selective H₂ antagonist burimamide is capable of inhibiting paw edema induced by the histamine releasing agent 48/80. Prior to December 30, 1994, it was known that these compounds are not effective antihistamines, since they are not selective H₁ antagonists. Therefore, it was known by December 30, 1994 that compounds which are not effective in the treatment of allergic conditions can inhibit histamine-induced paw edema in rodents.

9. Because of what was known about the histamine-induced paw edema test, the experiments described in document D1 would not have convinced me that the compound tested is a selective H₁ antagonist. In other words, D1 would not have convinced me that the compound tested could effectively be used to treat allergic conditions such as allergic rhinitis. Before drawing such a conclusion, I would have considered it essential to characterize the compound using one or more pharmacological models known to show anti-allergic activity. Examples of models suitable for assessing efficacy in allergic rhinitis are disclosed in documents E15, E16 and E17.

III. THE SAFETY OF A DRUG USED TO TREAT NON-LIFE-THREATENING DISEASES IS OF PARAMOUNT IMPORTANCE

10. It is imperative that drugs used to treat non-life-threatening diseases, such as allergic rhinitis, be safe. This is in contrast to drugs used to treat severe diseases, such as cancer, where the risk of adverse effects such as cardiac arrhythmia or cardiac arrest is outweighed by the severity of the disease.

11. Before December 30, 1994, I was concerned by reports that certain compounds known as "piperadine H₁ antagonists" can cause cardiovascular side effects, such as cardiac arrest, torsades de pointes, and ventricular arrhythmias. I was concerned because I did not want to expose patients who suffered from the mere discomfort of allergic rhinitis to the risk of heart arrhythmia or death.

IV. BEFORE THE EARLIEST FILING DATE OF THE PATENT APPLICATION, NO PROOF EXISTED THAT DCL WAS NOT CARDIO-TOXIC

12. Loratadine was a known H₁ antagonist, or antihistamine, before December 30, 1994. The fact that loratadine metabolizes to form the structurally similar compound descarboxyloratadine ("DCL") was also known by that time. *See, e.g.*, document D2.

13. Before the earliest filing date of the Patent Application, loratadine was considered by those skilled in the art to be a member of a class of compounds known as "piperadine H₁ antagonists," which also includes terfenadine and astemizole. The chemical and pharmacological similarities of loratadine, terfenadine and astemizole were well known by that time. This is evidenced, in part, by document E18, which is considered to be a standard work in the field of pharmacology. E18 describes loratadine in the first column on page 587 as being a member of the class piperidine H₁ antagonists. Although only one other member of class, terfenadine, is mentioned in this passage, astemizole and terfenadine are identified as members of the class in Table 23-3 on page 585. Further confirmation that loratadine, terfenadine and astemizole were considered to belong to the same class of drugs can be found on pages 583, 584 and 586 of E18.

14. In 1994, before the earliest filing date of the Patent Application, I expected DCL to share certain fundamental properties with loratadine because of the compounds' similar chemical structures and pharmacological relationship. However, it is suggested in the Decision to Refuse European Patent Application No. 95943722.9 that the chemical differences between terfenadine and astemizole, on one hand, and loratadine and DCL, on the other, are such that those skilled in the art would have expected loratadine and DCL to behave differently from terfenadine and astemizole *in vivo*. This was simply not the case in

1994. Indeed, I considered reports concerning the adverse effects of one piperadine H₁ antagonist to be relevant to the safety of other members of that class.

15. In this regard, it was well known by December 30, 1994 that very serious cardio-toxic side effects had been reported for two piperadine H₁ antagonists, terfenadine and astemizole. *See, e.g.*, documents E2 and E3. I considered it possible that these side effects, which included ventricular arrhythmia, particularly torsades de pointes, cardiac arrest and even death, could be class effects, common to all piperadine H₁ antagonists. Indeed, similar cardio-toxic side effects were reported for loratadine in document E5. Moreover, document E8 reported that loratadine and DCL interact with ketoconazole to give raised serum levels, which is precisely the effect that precipitates the cardio-toxicity of fellow class member terfenadine. *See* document E3.

16. Before the earliest filing date of the Patent Application, those skilled in the art were aware of other adverse effects associated with loratadine. For example, document E7 reported the occurrence of personality changes. More seriously, document E1 reported that both loratadine and fellow class member astemizole can promote tumor growth in animals.

17. By late 1994, I had formed the view, which I believe was commonly held by those active in the field, that cardio-toxicity is a serious side effect that is potentially associated with all piperadine H₁ antagonists. I also believed that because DCL is an active metabolite of loratadine, it might cause personality changes and promote tumour growth.

18. It is suggested in the Decision to Refuse European Patent Application No. 95943722.9 that drug interactions would not be considered a serious side effect. This is incorrect. The capacity of a drug to cause serious and sometimes fatal side effects through interactions with other drugs is, and always has been, a matter of great concern to those in the pharmaceutical industry and medical community. For example, the interaction between terfenadine and ketoconazole, reported in E3, was considered so serious by the United States Food and Drug Administration that it required the placement of a warning on terfenadine labels. *See* E3. The drug interaction was also one of the factors which led to the eventual withdrawal of terfenadine from U.S. and other markets.

19. In the Decision to Refuse European Patent Application No. 95943722.9, it is suggested that metabolites are often "just as effective as original compounds, but without some or all side effects" associated with their parent compounds. This, too, is incorrect. In fact, scientific literature suggests just the opposite.

20. For example, document E20, which is a standard text book, states on page 149 that "one of the major natural functions of drug metabolism, i.e., the formation of more polar

and water-soluble derivatives ... results in reduction of the pharmacological activity of a drug and its rapid excretion.” On page 150, it is stated that “for these reasons, drug metabolism usually leads to an accelerated termination of pharmacological activity,” and that “[a]lthough most drug metabolites are less biologically active than their parent compounds, in quite a few instances a more toxic metabolite is actually produced.” Likewise, page 33 of document E21, which is another standard text, states that “[d]rug metabolism generally changes a drug to more water-soluble metabolites,” and goes on to state that “the body can form a toxic metabolite from a less toxic drug.” Moreover, “[d]rug metabolism generally produces inactive metabolites from active drugs. ... The toxicity of some compounds may be caused by a metabolite. The insecticide parathion is changed in the body to the more toxic paraoxon.” Specific examples of drugs that are metabolised to inactive metabolites include epinephrine (*see* document E18, page 197), norepinephrine (*see* document E18, page 199) estrogens (*see* document E22, page 812), methylphenidate (*see* document E22, page 459), and corticosteroids (*see* document E22, page 770).

21. Particularly relevant to what was known about the toxicity of histamine metabolites is the black-box warning that the U.S. Food and Drug Administration (FDA) required be added to the label of astemizole. *See Physicians Desk Reference*, 1088-1090 (48th ed., 1994) (attached hereto as Exhibit C). The warning stated that “rare cases of serious cardiovascular adverse effects including death, cardiac arrest, QT prolongation, torsades de pointes, and other ventricular arrhythmias have been observed in patients” and that “data suggest that these events are associated with astemizole and/or astemizole metabolite levels.” *Id.* (emphasis added). The warning was announced by the FDA in “Warnings Issued on Nonsedating Antihistamines and Terfenadine and Astemizole,” *JAMA* 268(6):705 (1992) (attached hereto as Exhibit D), which simultaneously announced a warning for terfenadine. Consequently, in 1994, those skilled in the art understood that metabolites of piperadine H₁ antagonists could exhibit the same—or be responsible for—the serious adverse effects associated with their parent compounds.

22. In sum, safety is of paramount concern to those developing new drugs for the treatment of allergic disorders such as allergic rhinitis. Before December 30, 1994, those skilled in the art considered loratadine to be a member of a class of compounds that were known to exhibit severe adverse effects, such as ventricular arrhythmia, cardiac arrest, and death. At that time, I had no reason to expect that loratadine and DCL did not also share those same adverse effects. Consequently, I would not have considered DCL to be a safe and effective alternative to loratadine or other piperadine H₁ antagonists.

23. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that

these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, and any patent issuing thereon.

IN TESTIMONY WHEREOF, I hereunto set my hand and seal the day and year set opposite my signature.

Dated: 10/21/13 W. Storms, MD L.S.

State of Colorado)

) SS.:

County of El Paso)

On 10/21/13, before me, Beth Carlisle, Notary Public, personally appeared William W. Storms, M.D., personally known to me on the basis of satisfactory evidence to be the person whose name is subscribed to the within instrument and acknowledged to me that, by his signature on the instrument, she executed the instrument.

WITNESS my hand and official seal

Beth A. Carlisle

exp: 8/27/17

EXHIBIT A

CURRICULUM VITAE

WILLIAM W. STORMS, M.D.

PERSONAL INFORMATION

Date of Birth: May 18, 1942
Place of Birth: Racine, Wisconsin
Spouse: Bette
Children: Trisha, Cathy, Jenny

Home: 3855 Hermitage Drive, Colorado Springs, CO 80906
(719) 632-2702

Offices: Asthma & Allergy Associates
2709 N. Tejon St., Colorado Springs, CO 80907
(719) 473-0872 Fax: (719) 630-3658

41 Montebello Rd. #202
Pueblo, CO 81001
(719) 564-2503 Fax: (719) 545-7675

E-Mail Address: SneezeDoc@aol.com
SSN: 390-40-9558

PRESENT ACADEMIC RANK & OTHER POSITIONS

Clinical Professor of Medicine, University of Colorado Health Sciences Center,
Denver, Colorado
Practicing Allergist, Asthma & Allergy Associates, P.C., Colorado Springs, CO
Co-Director, The Research Center, Asthma and Allergy Associates, Colorado Springs, CO
Member of Sports Medicine Committee of the U.S. Olympic Committee 1997 to present
IRB member, United States Olympic Committee, 1997 to present
National Asthma Education and Prevention Program Coordinating Committee, (NHLBI
Asthma Guidelines) 1998 to present
Co-Chair, Professional and Patient/Public Education Subcommittee of the NAEPP 1998
to present
Representative to Task Force On Allergic Disorders: Promoting Best Practice

EDUCATION

University: Northwestern University, Evanston, Illinois, B.A. Degree, 1964
Medical School: University of Wisconsin Medical School, Madison, Wisconsin,
M.D. Degree, 1968
Internship: San Francisco General Hospital, San Francisco, California,
1968-69
Residency: Internal Medicine Residency; University of Wisconsin Hospital,
Madison, Wisconsin, 1969-70, 1972-73
Military Service: U.S. Army Hospital, Fort Carson, Colorado, Allergy Service, 1970-72

EDUCATION (cont.)

Fellowship: Allergy and Immunology; University of Wisconsin Hospital,
Madison, Wisconsin, 1973-75
Private Practice: Asthma & Allergy Associates, P.C., Colorado Springs, CO,
1975 to present

BOARD CERTIFICATION

American Board of Internal Medicine, 1974
American Board of Allergy and Immunology, 1975
Recertification: American Board of Allergy and Immunology, 1987

MEDICAL LICENSURE Colorado #16815

SOCIETY MEMBERSHIPS

Fellow, American College of Physicians
Fellow, American Academy of Allergy, Asthma and Immunology
Fellow, American College of Allergy, Asthma and Immunology
Fellow, American College of Chest Physicians
Western Society of Allergy and Immunology
American Thoracic Society
Trudeau Society
Colorado Allergy Society
American Association for the Advancement of Science
European Respiratory Society
Colorado Medical Society
European Academy of Allergology and Clinical Immunology

MEMBERSHIP ON COMMITTEES; OFFICES HELD

Board of Regents Member, American College of Allergy and Immunology, 1990 to 1993
President, Colorado Allergy Society, 1990-92
President, Western Society of Allergy and Immunology, 1987-88
Chairman, Public Relations Committee, American College of Allergy and Immunology, 1988
Chairman, Bylaws Committee, Penrose Hospital, Colorado Springs, 1985 to 1988
Chairman, American Academy of Allergy and Immunology Sports Medicine Committee, 1994-97
Steering Committee, American College of Chest Physicians Section on Allergy and
Clinical Immunology, 1986-91
El Paso County Medical Society Delegate to the Colorado Medical Society, 1989 to 1996
Advisory Board Member of Strategic Institute, a CME provider, Vienna, Virginia, 1996 to
present
Member of The Steering Committee of the Aspen Allergy Conference 1997 to present

MEDICAL JOURNAL EDITORIAL BOARD MEMBERSHIP

Annals of Allergy, Asthma and Immunology, 1993 to 1998

Journal of Asthma, 1992 to present

Pediatric Rounds Newsletter, 1996 to present

OTHER ACTIVITIES, ORGANIZATIONS, & AWARDS

Distinguished Fellow of the American College of Allergy, Asthma & Immunology. Presented at the awards convocation November 6, 1998 in Philadelphia, PA.

Bela Schick invited Lectureship, American College of Allergy, Asthma, & Immunology, Annual Meeting, San Francisco, November 1994

President, Cheyenne Mountain Zoological Park, 1991-92

Board of Trustees Member, 1987 to 1995

Vestry member, Chapel of Our Saviour Episcopal Church, Colorado Springs, 1978-81

Listed in "The Best Doctors in America: Central Region." 1996-1997.

Who's Who in Health and Medicine, 1989 to present

Student Volunteer, Project Hope, Colombia, South America, Summer 1967

Vice President, Broadmoor Ski Racing Academy, Inc., 1979-82

Volunteer Physician, Colorado Champ Camp (for children with asthma), 1985-95

PRESENTATIONS AT NATIONAL & INTERNATIONAL MEETINGS (cont.)

15. "Allergic Rhinitis" Washington University Symposium on Allergic Disease, St. Louis, November, 1990
16. "A Once-A-Day Nasal Steroid (Nasacort - triamcinolone acetonide) is Effective Therapy for Perennial Allergic Rhinitis." Presented at the Ninth Annual Aspen Allergy Conference, July 23-27, 1991, Aspen, Colorado
17. "New Therapeutic Approaches to Allergic Rhinitis," American Academy of Allergy and Immunology, March 1992; Orlando, Florida
18. "Lipoxygenase and Leukotriene Inhibitors." Presented at the 1992 American College of Allergy and Immunology Symposium entitled "A New Age In the Therapy of Allergic Diseases," November 18, 1992.
19. "Sch 1000 - An Anticholinergic Bronchodilator." Presented at the Symposium on the Parasympathetic Pathway in Obstructive Lung Disease, Killarney, Ireland, 1974
20. "Azelastine in Bronchial Asthma." Presented at the Azelastine Symposium at the International College of Allergy and Clinical Immunology, Washington, D.C., October, 1985
21. "Ipratropium in the Treatment of Asthma." Presented at the Symposium on Cholinergic Pathways in Lung Disease, Toronto, July, 1986
22. "Bronchodilator Properties of Azelastine." Azelastine Workshop - American Lung Association Meeting, New Orleans, May, 1987
23. "Azelastine: U.S. Experience in Seasonal and Perennial Rhinitis." Presented at the XIVth Congress of the European Academy of Allergology and Clinical Immunology, Berlin (West), September, 1989
24. "Effect of Repeat Action Albuterol Sulfate (Proventil® Repetabs®) in Nocturnal Asthma," presented at the XIV International Congress of Allergology and Clinical Immunology, Kyoto, Japan, October, 1991
25. "The Effect of Repeat Action Albuterol Sulfate Tablets (Proventil® Repetabs®) in the Treatment of Nocturnal Asthma," presented at the Fifth International Conference on Chronobiology, Amelia Island, Florida, July 16, 1992
26. "Rationale for the Use of Antihistamines in Allergic Rhinitis," International Symposium of Infection and Allergy of the Nose, Seoul, Korea, October 8-11, 1993
27. "Fluticasone Nasal Spray: Comparator Studies in Allergic Rhinitis," European Academy of Allergy and Immunology, Stockholm, Sweden, June 1994

PRESENTATIONS AT NATIONAL & INTERNATIONAL MEETINGS (cont.)

28. Moderator and Discussant, Interesting Case Symposium, American College of Allergy, Asthma & Immunology, Annual Meeting, San Francisco, CA, November 1994
29. Co-Chairman of the Olympic Exercise Asthma Symposium, Colorado Springs, CO, December 2-4, 1994.
30. "Diagnosis and Treatment of Asthma." Lecture at the American Academy of Family Physicians. Annual Meeting, Orlando, FL, September 1995.
31. "Exercise Asthma in Athletes." Presented at the Eastern Allergy Conference, April 18, 1995.
32. "Asthma Quality of Life Surveys in an Office Setting," ACAAI Managed Care Conference, Washington DC, April 12, 1996.
33. Chairman, United States Olympic Committee Conference on Asthma for Physicians, Coaches and Athletic Trainers, November 1996, U.S. Olympic Training Center, Colorado Springs, CO.
34. Moderator and speaker, ACAAI Annual Meeting Saturday Morning Conference, San Diego, CA.
35. Speaker, AAAAI Sunday Evening Symposium on the Treatment of Asthma, March 1998, Washington DC.
36. Luncheon moderator "Treatment of Rhinitis and Its Effects on the Lower Airway", Sunday symposium at the AAAAI meeting, Washington DC, March 1998.
37. Speaker on Exercise-Induced Asthma at the 1st Sports Medicine Conference of the Arab World, Kuwait University, Kuwait City, Kuwait, March 1998.
38. Speaker at the International Congress of Pediatric Allergy & Immunology, Cordoba, Argentina, May 24-27, 1998 ("Safety and efficacy of montelukast in children: a review of clinical data"; "Improving control of asthma in the moderately severe asthmatic".
39. "The Profile of the Ideal Nasal Steroid" at the European Academy of Allergy and Clinical Immunology Meeting, Brussels, Belgium, July, 1999
40. "Exercise Induced Asthma", presented at Cornell Medical College Allergy Teaching Day, New York, NY, October, 1999.
41. "Asthma and Rhinitis", presented at the American College of Allergy, Asthma and Immunology Annual Meeting, Chicago, IL, November, 1999.

CLINICAL TRIALS PERFORMED AT THE RESEARCH CENTER

Ipratropium bromide inhaler for the treatment of asthma - various studies, 1975-1990
Flunisolide inhaler for the treatment of asthma - 1977
Taziflyline tablets in rhinitis - 1987
Albuterol inhalant solution for asthma - 1984
Ketotifen syrup for children in asthma - 1984-1987
Procaterol inhaler for asthma - various studies - 1984-1990

CLINICAL TRIALS PERFORMED AT THE RESEARCH CENTER (cont.)

Alupent inhaler for children with asthma - 1985-1989
Triamcinolone nasal spray for the treatment of rhinitis - various studies, 1986-1991
Loratadine and loratadine decongestant tablet studies for the treatment of rhinitis – 1986 to 1995
Tazifyline tablets in rhinitis - 1987
Enprofylline tablets for asthma - 1987
Proventil Repetabs for asthma - 1987-1989, 1992
Budesonide inhaler for asthma and rhinitis - 1987, 1991-1995
Efficacy of azelastine in perennial allergic rhinitis - 1988
Intal MDI for asthma - 1988
MK 571 capsules for asthma - 1989
Accolate inhaler and tablet for asthma - 1989-1995
Auranofin capsules for steroid dependent asthmatics - 1989-1990
Nedocromil inhalant solution for children with asthma - 1990
Salmeterol inhaler for asthma - 1990-1995, 1997
SCH 37370 tablet for rhinitis - 1990-91
Azelastine nasal spray for rhinitis - 1990
Vancenase-AQ vs. Nasalcrom in allergic rhinitis (pediatric) - 1990
Triamcinolone nasal spray (Nasacort) in allergic rhinitis (pediatric) - 1990
Pemirolast - 1991
Oral ebastine for allergic rhinitis – 1991-1998
Formeterol in Asthma - 1992
MK-0591 for asthma - 1992-1993
Vanceril DS - 1992-1993
Zileuton in Asthma - 1992, 1994, 1997
Fluticasone in Asthma and Rhinitis Adult and Pediatric - 1992-1995, 1997, 1998
Albuterol Turbuhaler - 1993
CP-80633 Tablet for Asthma - 1993
RP-73401 in Asthma - 1993
Uniphyl vs Beclovent - 1993
Non-CFC Salbutamol - 1993
MK-0476 in adults & pediatrics for asthma – 1993-1999
Mometasone in Asthma and Rhinitis - 1993-1994, 1997-1998, 1999
rhu-IL-1R and rhu-IL-4R in Asthma - 1993-1994, 1999
Ceftibuten in Sinusitis - 1993-1994
Azelastine in Asthma - 1993-1995
Cetirizine in Allergic Rhinitis – 1994, 1997-1998
HOE 140 in Asthma – 1994
Nasacort Prophylaxis in Allergic Rhinitis - 1994
PDA-641 Capsules in Asthma – 1994-1996
Terfenadine and Metabolite in Rhinitis - 1994
Non-CFC Beclomethasone - 1994-1995, 1997-1998
Patient Compliance with Bronchodilator Therapy in Asthma – 1994
Atrovent in Allergic Rhinitis - 1994-1995
Effects of Vancenase on Growth - 1994
M94-216 in adult asthma - 1995
Non-CFC Azmacort in adults with asthma - 1995
Accolate in pediatric patients with asthma – 1995-1998

CLINICAL TRIALS PERFORMED AT THE RESEARCH CENTER (cont.)

Accolate in adults with asthma – 1995-1998
SB205312 in adults with allergic rhinitis - 1995
SB205312 in adults with asthma – 1995
SR 27417A in adults with asthma – 1995-1996
AA 2414 in adults with asthma – 1995
Budesonide nebulizing solution – 1995-1996
Atrovent nasal spray in adults with rhinitis – 1995
Fluticasone in sinusitis – 1996-present
BAYx7195 in adults with asthma – 1996
Double-strength beclomethasone nasal spray in adults with asthma and rhinitis – 1996
RPR 106541T in adults with asthma – 1996
D7193 in adults with asthma – 1996
RG50294 in adults with rhinitis – 1996
Non-CFC Intal in exercise-induced asthma – 1997
Fexofenadine in adults and pediatrics in rhinitis – 1994-1995, 1997
Fexofenadine in adult urticaria – 1996-1997
SB 207499 in adult COPD – 1997
Serevent in adult COPD – 1997-1998
Raxar in adult sinusitis – 1997-1998
Tiotropium in adult asthma – 1997
Norestemizole in allergic rhinitis – 1997
Zanamavir in influenza – 1998, 1999
Seratrodast in adult COPD – 1997
Seratrodast in adult asthma – 1996
MK-0966 in adults with osteoarthritis – 1997-1999
MK-0663 in adults with osteoarthritis – 1998 to present
Salmeterol/fluticasone in COPD – 1998-1999
Azelastine in vasomotor rhinitis – 1999
HMR 3647A in adult sinusitis – 1998-1999
Astra AR-C68397AA in COPD – 1998-1999
Fluticasone versus zafirlukast in asthma – 1998-1999
Salmeterol/fluticasone in adult asthma – 1998-1999
Merck L-808,065 in adult asthma – 1998-1999
Deslorafadine in adult rhinitis and asthma – 1999
Montelukast in adults with rhinitis and asthma – 1999
Effects of nasal fluticasone on growth – 1999
Effects of Accolate on growth – 1999
Effects of Azmacort on growth – 1999
Lansoprazole in adults with asthma and GERD – 1999
Montelukast in exercise-induced asthma in adults and pediatrics – 1999
Accolate in pediatric exercise-induced asthma – 1999
Effect of Rhinocort on growth – 1999

PUBLICATIONS

1. Chloroform parties, Storms WW, JAMA 225:160-165, July 9, 1973.
2. Aerosol Sch 1000: an anticholinergic bronchodilator, Storms W, DoPico G, and Reed CE, Amer Review of Resp Dis, 111:149, April 1975.
3. Alternaria IgG precipitins and adverse reactions, Busse WW, Storms WW, Crandal M, and Reed CE, J Allergy Clin Immunol, 57:367, April 1976.
4. Antibody-dependent cellular cytotoxicity in asthmatics, Flaherty DK, Martin JM, Storms WW, Kriz RJ, Surfus JE and Reed CE, J Allergy Clin Immunol, 59:48-53, 1977.
5. Occupational hypersensitivity lung disease, Storms WW, J of Occupational Med, 20:823-824, 1978.
6. Allergic reactivity of the Pikes Peak region, Storms WW, Southern Med Journal, 72:673-675, June 1979.
7. Miller moth asthma, Storms WW, Berry C, and Withee W, Clin Allergy, 11:55-59, January 1981.
8. Hay fever symptoms from the cotton of the cottonwood tree, Storms WW, Ann Allergy, 53:223-225, September 1984.
9. Albuterol nebulizer solution for the treatment of asthma, Storms WW, Hudson LD, DeGraff AC, Mendelson LM, Greenstein S, Ann Allergy, 55:779-782, December 1985.
10. Ipratropium bromide (Atrovent^R): A new anticholinergic bronchodilator for the treatment of asthma, Storms WW, Immunol Allergy Practice, Vol III, P 53-59, February 1986.
11. Bitolterol mesylate aerosol in adults with steroid-dependent asthma: A comparison with isoproterenol hydrochloride aerosol, Nathan RA, Bodman SF, Storms WW, Mingo TS, Ann Allergy, 56:494-499, June 1986.
12. Use of ipratropium bromide in asthma: Results of a multi-clinic study, Storms WW, Bodman SF, Nathan RA, Busse WW, Bush RK, Falliers CJ, O'Hollaren JD, and Weg JG, Amer J Med, 81:61-66 (suppl 5A), November 1986.
13. SCH: 434; A new antihistamine/decongestant for seasonal allergic rhinitis, Storms WW, Bodman SF, Nathan RA, Chervinsky P, Banov CH, Dockhorn RJ, Jarmoszuk I, Zeitz HJ, McGeady SJ, Pinnaas JL, Greenstein S, J Allergy Clin Immunol, June 1989, Vol 83, No.6:1083-1090.
14. Procatrol metered-dose inhaler: A multiclinic study evaluating the efficacy and safety in patients with asthma, Storms WW, Chervinsky P, Bell T, Kemp JP, Brandon ML, Reed CE, Siegel SC, Repsher L, Ann Allergy, 63:444-448, November 1989.

PUBLICATIONS (cont.)

15. Evaluation of the safety and efficacy of multiple doses of Azelastine to adult patients with bronchial asthma over time, Tinkelman EG, Bucholtz GA, Kemp JP, Koepke JW, Repsher LH, Spector SL, Storms WW, vanAs A, Am Rev Resp Dis, 141:569-574, 1990.
16. Managing Allergic Rhinitis: Implications for the upper and lower airways, Kaliner MA, Beer DJ, Bone RC, Busse WW, Creticos PS, Gardiner LJ, Lillington GA, McFadden EF, Naclerio RM, Storms WW, Nelson HS, Pipkorn U, Raphael GD, Simons FE, Slavin RG, Toffel PH, Ziemniak JA, J Resp Dis, March 1991.
17. Metaproterenol (AlupentTM) metered-dose inhaler in children 5-12 years of age, Storms WW, Bierman CW, Chai H, Dockhorn RJ, Eggleston P, Ellis EF, Feldman C, Fink JN, Hemstreet MP, Kniker WT, Knutsen A, Konig P, Mansmann H, Siegel S, Krantman H, Tinkelman D, Townley R, Wecker M, Jaeger J, J Allergy, 28:369-379, 1991.
18. The effect of repeat action albuterol sulfate (ProventilR Repetabs^R) in nocturnal asthma, Storms WW, Nathan RA, Bodman SF, Morris RJ, Selner JC, Greenstein SM, Zwillich CW, J of Asthma, 29(3):205-212, 1992.
20. Hay Fever: What it is and what to do about it, Storms WW, Asthma and Allergy 1992, Healthline, Menlo Park, CA.
21. Effect of acute inhalation of albuterol on submaximal and maximal VO₂ and blood lactate, Fleck SJ, Lucia A, Storms WW, Wallach JM, Vint PF, Zimmerman SD, Int J Sports Med, 14(1993):239-243.
22. Long-term safety of triamcinolone acetonide nasal aerosol for the treatment of perennial allergic rhinitis, Welch MJ, Bronsky E, Findlay S, Pearlman D, Southern L, Storms W, Weakley S, Clin Therapeutics, 16(2),(1994):253-262.
23. Patient compliance with bronchodilator therapy in asthma, Storms, WW, Current Therapeutic Research, 55(9),(1994):1038-1046.
24. The effects of albuterol on power output in non-asthmatic athletes, J.T. Lemmer, S.J. Fleck, J.M. Wallach, S. Fox, E.R. Burke, J.T. Kearney, W.W. Storms, Int J Sports Med, 16(1995):243-249.
25. Practice parameters for allergy diagnostic testing, Bernstein IL, Storms WW, Ann Allergy, 75(6):December (Part 11) 1995.
26. Corticoid-sparing effect of azelastine in the management of bronchial asthma, Busse WW, Middleton E, Storms W, Dockhorn RJ, Chu TJ, Grossman J, Weiler JM, Bronsky EA, Mansfield LE, Bell TD, Hemsworth GR, Perhach JL, D'Eletto TA, Dam A. Am J Respir Crit Care Med, 153 (1996):122-127.
27. Effect of allergy specialist care on the quality of life in patients with asthma, Storms B, Olden L, Nathan R, Bodman S. Ann Allergy, 75 (6):December (Part 1) 1995.

PUBLICATIONS (cont.)

28. Evaluation of the topical versus systemic effects of triamcinolone acetonide aqueous (TAA) nasal spray in allergic rhinitis, Storms B, Procaccini RL, Smith JA, J Allergy Clin Immunol, Vol. 95, No. 1, part 2, pg. 197 (Abst. 223), January 1995.
29. Prophylactic use of topical triamcinolone acetonide nasal inhaler in patients with seasonal allergic rhinitis, Storms W, Bernstein D, LaForce C, Pearlman D, Proud D, Kagey-Sobotka A, Lim J, Creticos P, J Allergy Clin Immunol, Vol. 97, No. 1, Part 3, January 1996.
30. Improving the treatment of nocturnal asthma: Use of an office questionnaire to identify nocturnal asthma symptoms, Storms WW, Nathan RA, Bodman SF, Byer B, J of Asthma 3(33):165-168(1996).
31. Clinical studies of the efficacy and tolerability of ebastine 10-20 mg once daily in the treatment of seasonal allergic rhinitis in the US, Storms WW, Drugs, 52:20-25 (suppl 1), 1996.
32. Management of sinusitis in the asthmatic patient, Storms W, Ann Allergy, 77(1):July 1996.
33. The impact of managed care formularies on the practice of allergy-immunology, Ann Allergy Asthma Immunol, Vol 77, No.1:4-5 (1996).
34. Efficacy of triamcinolone acetonide aerosol nasal inhaler in children with perennial allergic rhinitis, Storms WW, Southern DL, et al, Ped Asthma, All & Immunol, Vol 10, No.2: 59-64 (1996).
35. Update on exercise-induced asthma, a report of the Olympic exercise asthma summit conference, Storms WW, Joyner DM, Physician & Sportsmedicine, Vol 25, No.3: 45-55 (1997).
36. Quality of life and rhinitic symptoms: results of a nationwide survey with the SF-36 and RQLQ questionnaires, Meltzer EO, Nathan RA, Selner JC, Storms W, J Allergy Clin Immunol, Vol 99:S815-9 (1997).
37. The effects of salmeterol on power output in nonasthmatic athletes, McDowell SL, Fleck SJ, Storms WW, J Allergy Clin Immunol, Vol 99, No.4: 443-449 (1997).
38. Prevalence of allergic rhinitis in the United States, Nathan RA, Meltzer EO, Selner JC, Storms W, J Allergy Clin Immunol, Vol 99, No.6-2: S808-814 (1997).
39. Allergic rhinitis: the patient's perspective, Storms W, Meltzer EO, Nathan RA, Selner JC, J Allergy Clin Immunol, Vol 99, S825-8 (1997).
40. The economic impact of allergic rhinitis, Storms W, Meltzer EO, Nathan RA, Selner JC, J Allergy Clin Immunol, Vol 99, S820-4 (1997).
41. Treatment of allergic rhinitis: effects of allergic rhinitis and antihistamines on performance, Storms WW, Allergy & Asthma Proc, Vol 18, No. 2: 59-61 (1997).

PUBLICATIONS (cont.)

42. Efficacy and safety of fexofenadine hydrochloride for treatment of seasonal allergic rhinitis. Bernstein DI, Schoenwetter WF, Nathan RA, Storms W, Ahlbrandt R, Mason J. *Ann Allergy Asthma Immunol*, 1997;79:443-8.
43. The Rationale For The Use of H1-Receptor Antagonists, Storms, WW, *Am J Rhinol* 8:376, 1994.
44. A practical approach to the diagnosis and management of allergic rhinitis. Storms WW. *Amer Journal of Integrated Health Care*, Vol 1, No. 2 (Winter):78-87 (1998).
45. Clinical adverse effects of inhaled corticosteroids: Results of a questionnaire survey of asthma specialists. W Storms, C Theen, *Ann Allergy*, 80:391-4, May 1998.
46. Risk-benefit assessment of fluticasone propionate in the treatment of asthma and allergic rhinitis. W Storms, *J Asthma*, 35(4):313-336, 1998.
47. Effects of the inhaled corticosteroids fluticasone propionate, triamcinolone acetonide, and flunisolide and oral prednisone on the hypothalamic-pituitary-adrenal axis in adult patients with asthma. Sorkness CA, LaForce C, Storms W, et al, *Clin Ther*, 1999; 21(2):353-367.
48. A comprehensive diagnostic approach to upper airway disease. W Storms, *J Allergy Clin Immunol*, 1998;101:S361-3.
49. Clinical adverse effects of inhaled corticosteroids: results of a questionnaire survey of asthma specialists. W Storms, C Theen, *Ann Allergy Asthma Immunol*, 1998;80:391-4.
50. Ipratropium bromide nasal spray 0.03% and beclomethasone nasal spray alone and in combination for the treatment of rhinorrhea in perennial rhinitis. R Dockhorn, D Aaronson, E Bronsky, P Chervinsky, R Cohen, R Ehtessabian, A Finn, J Grossman, W Howland, H Kaiser, D Pearlman, J Sublett, P Ratner, G Settipane, T Sim, W Storms, R Webb, K Drda, C Wood, *Ann Allergy Asthma Immunol*, 1999;82:349-359.
51. Administration of budesonide once daily by means of Turbuhaler to subjects with stable asthma. E McFadden, T Casale, T Edwards, J Kemp, J Metzger, H Nelson, W Storms, M Neidl, *J Allergy Clin Immunol* 1999;104:46-52.
52. Exercise-induced asthma: diagnosis and treatment for the recreational or elite athlete. W Storms, *Med Sci Sports Exerc* 31:S33-38, 1999.
53. Double-blind, placebo-controlled study of single doses of chlorofluorocarbon (CFC) and CFC-free cromolyn sodium for exercise-induced bronchoconstriction. W Storms, *Current Therapeutic Res* 1999;60(12):629-37.
54. Atypical symptoms can mask the diagnosis. Exercise-induced asthma: making the diagnosis. W Storms, *J Respir Dis* 2000;21(8):491-494.

BOOK CHAPTERS

1. Update on the outpatient treatment of asthma. Storms WW in Comp Therapy, 18(3):31-36, 1992.
2. Do asthma medications enhance sports performance in athletes who do not have asthma? Storms WW in All Resp Dis Sports Med, Marcel Dekker, New York, 1997.

PUBLISHED ABSTRACTS

1. A Study of atopic dermatitis, adenyl cyclase system and mitosis, Lee TP, Storms WW, Busse W, Reed CE, J Allergy Clin Immunol, 53:99, 1974 (abstr.)
2. Use of flow volume curves with air and helium-oxygen to evaluate pulmonary function in asthma, Storms WW, Bush R, and Reed CE, J Allergy Clin Immunol 57:252, 1976 (abstr.)
3. Intranasal immunization with attenuated live influenza vaccine in asthma, Storms WW, Dick EC, and Busse WW, J Allergy Clin Immunol, 58:284, 1976 (abstr.)
4. Allergenicity of the cotton of the cottonwood tree, Storms WW, New Eng Allergy Proceedings, Vol. 5:151, Spring 1984 (abstr.)
5. Azelastine (AZEL) in the treatment of asthma, Storms W, Middleton E, Dvorin D, Kemp J, Spector S, Newton J, and Perhach J, J Allergy Clin Immunol, 75:167, January 1985 (abstr.)
6. Multicenter trial of procaterol aerosol metered-dose inhaler vs. placebo in patients with asthma, Storms W, Chervinsky P, Bell T, Brandon M, Reed CE, Repsher L, Siegel S, and Kemp J, J Allergy and Clin Immunol, 75:161, January 1985 (abstr.)
7. Procaterol metered-dose inhaler in the treatment of asthma, Storms W, Bodman S, Nathan R, Wilson JM, Ann Allergy, 54:338, April 1985 (abstr.)
8. Albuterol inhalant solution for asthma, Storms W, Bodman S, Nathan R, Greenstein S, Ann Allergy, 54:367, April 1985 (abstr.)
9. A group comparative study of the safety and efficacy of nedocromil sodium (Tilade) in reversible airways disease: A preliminary report, VanAS A, Chick TW, Bodman SF, Storms WW, Nathan RA, Selner JC, Koepke JW, Townley RG, Bewtra AK, Nair N, Kemp JP, Meltzer EO, Welch MJ, and Prenner BM, Eur J Respir Dis, 69 (suppl 147): 143-148
10. Comparison of procaterol and albuterol aerosols in patients with reversible obstructive airways disease, Chervinsky P, Beaupre A, Bell T, Bronsky E, Busse W, Campbell S, Falliers C, Mazza J, Pinnas J, Reed C, Repsher L, Stalein J, Schoenwetter W, Stevens P, Storms W, and Tashkin D, J Allergy and Clin Immunol, 79:201, January 1987 (abstr.)
11. Efficacy of azelastine in perennial allergic rhinitis, Meltzer E, Storms W, Pierson W, Cummins L, Perhach J, and Hemsworth G, J Allergy Clin Immunol, 79:205, January 1987 (abstr.)
12. Efficacy of azelastine (AZ) in perennial allergic rhinitis, Storms WW, Bodman SF, Nathan RA, Perhach JL, and Hemsworth GR, Ann Allergy, 58:281, April 1987 (abstr.)

PUBLISHED ABSTRACTS (cont.)

13. Long-term treatment of asthma with procaterol metered-dose inhaler: a two and one-half year open label study, Storms WW, Bodman SF, and Nathan RA, Chest, 92:124S, August 1987 (abstr.)
14. WHR-5029 (triamcinolone acetonide nasal aerosol) in the treatment of seasonal ragweed allergic rhinitis (SRAR), Storms WW, Bodman SF, Nathan RA, Gawchick SM, Rooklin AR, Gorder JW, and Huber FJ, Ann Allergy, 60:166, February 1988 (abstr.)
15. Variability of tree pollination over 5 years, Storms WW, Nathan RA, Burdekin EA, Ann Allergy, 60:158, February 1988 (abstr.)
16. SCH: 434 (loratadine 5 mg plus pseudoephedrine 120 mg) versus components in the treatment of seasonal allergic rhinitis, Storms WW, Bodman SF, Nathan RA, Trochelman L, Greenstein S, J Allergy Clin Immunol, 18:173, January 1988 (abstr.)
17. Evaluation of the safety and efficacy of long term use of multiple doses of Azelastine (AZ) in asthmatics, Tinkelman D, Bucholtz G, Kemp J, Repsher L, Spector S, Storms W, vanAs A, Koepke J, J Allergy Clin Immunol, January 1988 (abstr.)
18. Once-a-day Triamcinolone Acetonide (TA) nasal aerosol is effective for perennial allergic rhinitis (PAR), Storms W, Bronsky E, Findlay S, Pearlman D, Rosenbert S, Shapiro G, Southern L, Tinkelman D, Weakley S, Welch M, Zeitz H, Garcia J, Wilkinson D, Ann Allergy, 1:239, March 1989 (abstr.)
19. Azelastine: U.S. experience in seasonal and perennial rhinitis, Storms W, Hemsworth G, Freitag J, as published in Allergologie, September 1989 (abstr.)
20. Procaterol: Longer duration of action than albuterol (salbutamol) in a three month study, Beaupre A, Bell T, Boulet LP, Bronsky E, Busse W, Campbell SC, Chervinsky P, Falliers CJ, Mazza J, Pinnas JL, Tashkin DP, Reed CE, Repsher L, Schoenwetter W, Stablein J, Stevens P, Storms WW, Chest, 98:111S, August 1990
21. A comparison of the efficacy and safety of procaterol and albuterol in reversible obstructive airways disease, Mazza J, Beaupre A, Bell T, Boulet LP, Bronsky E, Busse W, Campbell SC, Chervinsky P, Falliers CJ, Pinnas JL, Tashkin DP, Reed CE, Repsher L, Schoenwetter W, Stablein J, Stevens P, Storms WW, Chest, 98:111S, August 1990
22. Inhibition by Aerosolized ICI 204,219, LTD receptor antagonist, of allergen-induced bronchoconstriction, Nathan RA, Storms WW, Bodman SF, Minkwitz MC, Glass M, J Allergy Clin Immunol, January 1991 (abstr.)
23. Once daily triamcinolone acetonide nasal spray is effective for the treatment of perennial allergic rhinitis, Storms W, Bronsky E, Findlay S, Pearlman D, Rosenberg S, Shapiro G, Southern L, Tinkelman D, Weakley S, Welch M, Zeitz H, Wilkinson D, McMahon S, Garcia J, Ann Allergy 66:329, April 1991

PUBLISHED ABSTRACTS (cont.)

24. Effect of repeat action albuterol sulfate (Proventil^R Repetabs^R) in nocturnal asthma, Storms W, Morris R, Selner J, Zwillich C, Greenstein S, Colorado Springs, CO, Minneapolis, MN, Denver, CO, Hershey, PA, Kenilworth, NJ, Allergy Immunol News, Supplement 1-1991 (presented at the XIV International Congress of Allergy and Clinical Immunology, October 4, 1991) (abstr.)
25. Comparison of intranasal therapy with beclomethasone dipropionate (BDP) vs cromolyn sodium (CS) vs placebo (P) in children with seasonal allergic rhinitis (SAR), Orgel HA, Meltzer E, Welch M, Banov C, Georgitis J, Morris R, Pedinoff A, Storms WW, J Allergy Clin Immunol, 89:303, January 1992 (abstr.)
26. Efficacy of nedocromil nebulizer solution on asthma symptoms in children maintained on bronchodilators, Dockhorn RJ, Bronsky EA, Ginchansky EJ, Kraimer MJ, Pearlman DS, Ratner PH, Storms WW, Amer Rev Respir Dis, 145:743, April 1992
27. Azelastine nasal spray - a well controlled trial to assess its safety and efficacy in seasonal allergic rhinitis (SAR), Storms W, Grossman J, Pearlman D, Chervinsky P, Halverson P, Widlitz M, Freitag J, Ann Allergy, 68:108, January 1992 (abstr.)
28. Albuterol and ergometry performance, Lucia A, Fleck SJ, Wallach JM, Vint PF, Storms WW, Zimmerman SD, Medicine & Science in Sports and Exercise, 24(5), May 1992 (abstr.)
29. Once-a-day ebastine is effective therapy for seasonal allergic rhinitis (SAR) in children, Storms WW, Garcia JD, Tobey RE, et al, J Allergy Clin Immunol, 91:197, January 1993
30. Nedocromil sodium (NED) 0.5% nebulizer solution improves asthma symptoms and pulmonary function in children. RJ Dockhorn, EJ Ginchansky, DS Pearlman, PH Ratner, WW Storms, Ann Allergy, 72:78, January 1994.
31. Long-term budesonide therapy in severe asthma: A 2½ year open label study. Poster presentation, Aspen Allergy Conference, July 1995.
32. Fluticasone Propionate (FP), Triamcinolone acetonide (TAA) and Flunisolide (FLN) have similar effects on the HPA axis. W Storms, WC Howland, CA Sorkness, C LaForce, M Goldstein, WR Lincourt, PR Rogenes, AE Schaberg, L Edwards, et al, J Allergy Clin Immunol, 99:S318, January 1997.
33. Efficacy of Astelin (azelastine) nasal spray in patients with vasomotor rhinitis. WW Storms, J Matz, P Ratner, J Allergy Clin Immunol 105:S205, January 2000.
34. The effect of fluticasone propionate nasal spray as adjunctive therapy to cefuroxime axetil on the resolution of radiographic evidence of an acute episode of sinusitis. W Storms, SD Miller, T Goldberg, D Henry, ST Goode-Sellers, et al, J Allergy Clin Immunol 105:S206, January 2000.

Revised 08/17/00

STATE OF COLORADO
DEPARTMENT OF REGULATORY AGENCIES
DIVISION OF REGISTRATIONS

BOARD OF MEDICAL EXAMINERS
ACTIVE

PRACTICE OF MEDICINE

16815

06/01/1999

05/31/2001

NUMBER

ISSUED

EXPIRES

WILLIAM WALLACE STORMS, MD
ALLERGY ASSOCIATES PC
2709 N TEJON ST
COLO SPGS CO 80907

DIRECTOR
DIVISION OF REGISTRATIONS

SIGNATURE

EXHIBIT B

References

- D1: WO 85/03707 (Schering Corporation), August 29, 1985.
- D2: Berthon *et al.*, "In Vitro Inhibition, by Loratadine and Descarboxyethoxyloratadine, of Histamine Release from Human Basophils, and of Histamine Release and Intracellular Calcium Fluxes in Rat Basophilic Leukemia Cells (RBL-2H3)," *Biochem. Pharmacol.*, 47(5): 789-794 (1994)
- E1: Brandes *et al.*, "Enhanced Cancer Growth in Mice Administered Daily Human-Equivalent Doses of Some H1-Antihistamines: Predictive *In Vitro* Correlates," *Journal of National Cancer Institute*, 86(10): 770-775 (1994).
- E2: Wiley *et al.*, "Clinical and Laboratory Observations, Cardiotoxic Effects of Astemizole Overdose in Children," *Journal of Pediatrics*, 120(5): 799-802 (1992).
- E3: FDA Warning, *JAMA*, 268(6): 705 (1992).
- E4: Goodman & Gilman's The Pharmacological Basis of Therapeutics, 9th Ed., p588 (1996).
- E5: Good *et al.*, "Loratadine and Ventricular Tachycardia," *Journal of Cardiology*, 74(15): 207 (1994).
- E6: "Antihistamines General Statement" obtained from Medscape website (<http://promini.medscape.com>).
- E7: English Translation of Nyman *et al.*, "Serious Side-Effect of the Antiallergic Loratadine - Warning Against Long-Term Use of Non-Prescription Preparation," *Lakartidningen*, 99(25): 2281 (1992).
- E8: Van Peer *et al.*, "Ketoconazole Inhibits Loratadine Metabolism in Man," *J. Allergy. Clin. Immuno.*, 48(Suppl.16): 34 (1993).
- E9: Heithoff *et al.*, "Desloratadine Improves Quality of Life in Patients with Seasonal Allergic Rhinitis," *J. Allergy. Clin. Immuno.*, 104(1): S383-4, Abstract No. 1121.
- E10: Nayak *et al.*, "Decongestant Effects of Desloratadine in Patients with Seasonal Allergic Rhinitis," *J. Allergy. Clin. Immuno.*, 104(1): S384, Abstract No. 1122.
- E11: Salmun *et al.*, "Efficacy and Safety of Desloratadine in Seasonal Allergic Rhinitis," *J. Allergy. Clin. Immuno.*, 104(1): S383-4, Abstract No. 1123.
- E12: Ezeamuzie *et al.*, "Effect of Histamine H₂-Receptor Antagonists on Acute Inflammatory of the Rat Paw Oedema," *J. Pharm. Pharmacol.* 41(4): 261-265 (1989).

- E13: Brimblecombe *et al.*, "The Pharmacology of Burimamide and Metiamide, Two Histamine H₂-Receptor Antagonists," *Federation Proceedings*, 35 (8): 1931-1934 (1976).
- E14: Shibuya *et al.*, "Topical Anti-Inflammatory Activity of Dexamethasone 17-Valerate," *Nippon Yakuriaku Zasshi*, 77(1): 73-85 (1981).
- E15: Takahashi *et al.*, "Allergic Rhinitis Model with Brown Norway Rat and Evaluation of Antiallergic Drugs," *J. Pharmacobio-Dyn.*, 13: 414-420 (1990).
- E16: Kawaguchi *et al.*, "Nasal Mast Cells in Experimentally Induced Allergic Rhinitis in Guinea-Pigs," *Clinical and Experimental Allergy*, 24: 238-244 (1994).
- E17: Abe *et al.*, "Antiallergic Effects of ZCR-2060: Effect on Allergic Cutaneous Reactions and Rhinitis Models in Mice and Rats," *Jpn. J. Pharmacol.*, 66: 95-103 (1994).
- E18: Goodman and Gilman's The Pharmacological Basis of Therapeutics, 8th Edition, pages 7, 197-199 and 582-588 (1990).
- E19: Merck Index, 12th Ed., pages 132 (Acrivastine), 892 (Astemizole), 5611 (Loratadine) and 9307 (Terfenadine) (1990).
- E20: Mandel, "Pathways of Drug Biotransformation: Biochemical Conjugations," in Fundamentals of Drug Metabolism and Drug Disposition, Williams & Wilkins, Baltimore, MD, pp 149-151 (1971).
- E21: Goth A: Medical Pharmacology, 9th Ed., pages 18-19 and 33 (1978).
- E22: Principles of Pharmacology, Paul L. Munson (Editor), pages 458-459, 770 and 812 (1996).
- E23: Woosley *et al.*, "Effects of Astemizole and its Metabolites on Cardiac Repolarization; Georgetown University Document No. AST-2, Sepracor Document 110-408 (Abstract) (1995).

EXHIBIT C

PDR®
48
EDITION
1994

PHYSICIANS' DESK REFERENCE®

Medical Consultant

Ronald Arky, MD, Charles S. Davidson, Professor of Medicine and Master,
Francis Weld Peabody Society, Harvard Medical School

Product Manager: Stephen B. Greenberg

Sales Manager: James R. Pantaleo

Account Managers

Dik N. Barsamian
Jeffrey M. Keller
Michael S. Sarajlan
Joanne C. Terzides

Commercial Sales Manager: Robin B. Bartlett

Direct Marketing Manager: Robert W. Chapman

Manager, Professional Data: Mukesh Mehta, RPh

Manager, Database Administration: Lynne Handler

Editor, Special Projects: David W. Sifton

Director of Production: Marjorie A. Duffy

Assistant Director of Production: Carrie Williams

Production Manager: Kimberly V. Hiller

Production Coordinator: Tara L. Walsh

Format Editor: Gregory J. Westley

Index Editor: Beverly Pfohl

Art Associate: Joan K. Akerlind

Manager, Electronic Prepress: Gregory J. Thomas

Digital Photography: Shawn W. Cahill



Copyright © 1994 and published by Medical Economics Data Production Company at Montvale, NJ 07645-1742. All rights reserved. None of the content of this publication may be reproduced, stored in a retrieval system, resold, redistributed, or transmitted in any form or by any means (electronic, mechanical, photocopying, recording, or otherwise) without the prior written permission of the publisher. PHYSICIANS' DESK REFERENCE®, PDR®, PDR For Nonprescription Drugs®, and PDR For Ophthalmology® are trademarks of Medical Economics Data Production Company, registered in the United States Patent and Trademark Office. PDR Guide to Drug Interactions-Side Effects-Indications™, The PDR® Family Guide to Prescription Drugs™, PDR® Library on CD-ROM™, PDR® Drug Interactions/Side Effects/Indications Diskette™, and Pocket PDR™ are trademarks of Medical Economics Data Production Company.

Officers of Medical Economics Data Production Company: President and Chief Executive Officer: Norman R. Sresni; Executive Vice President: Mark L. Weinstein; Senior Vice President and Chief Financial Officer: J. Crispin Ashworth; Senior Vice President of Operations: Curtis B. Allen; Vice President of Product Management: William J. Cole; Vice President of Sales: Krystyna H. Gunstale; Vice President of Sales and Marketing: Thomas F. Rice; Vice President of Operations: John R. Ware; Vice President of Information Systems and Services: Edward J. Zecchini; Vice President of Business Development: Raymond M. Zoetler

ISBN: 1-56363-061-3

Janssen Pharmaceutica—Cont.

Treatment: ERGAMISOL, administered orally, should be initiated no earlier than 7 and no later than 30 days post surgery at a dose of 50 mg q8h x 3 days repeated every 14 days for 1 year. Fluorouracil therapy should be initiated no earlier than 21 days and no later than 35 days after surgery providing the patient is out of the hospital, ambulatory, maintaining normal oral nutrition, has well-healed wounds, and is fully recovered from any postoperative complications. If ERGAMISOL has been initiated from 7 to 20 days after surgery, initiation of fluorouracil therapy should be coincident with the second course of ERGAMISOL, i.e., at 21 to 34 days. If ERGAMISOL is initiated from 21 to 30 days after surgery, fluorouracil should be initiated simultaneously with the first course of ERGAMISOL.

Fluorouracil should be administered by rapid IV push at a dosage of 450 mg/m²/day for 5 consecutive days. Dosage calculation is based on actual weight (estimated dry weight if there is evidence of fluid retention). This course should be discontinued before the full 5 doses are administered if the patient develops any stomatitis or diarrhea (5 or more loose stools). Twenty-eight days after initiation of this course, weekly fluorouracil should be instituted at a dosage of 450 mg/m²/week and continued for a total treatment time of 1 year. If stomatitis or diarrhea develop during weekly therapy, the next dose of fluorouracil should be deferred until these side effects have subsided. If these side effects are mod-

erate to severe, the fluorouracil dose should be reduced 20% when it is resumed.

Dosage modifications should be instituted as follows: If WBC is 2500-3500/mm³ defer the fluorouracil dose until WBC is > 3500/mm³. If WBC is < 2500/mm³, defer the fluorouracil dose until WBC is > 3500/mm³; then resume the fluorouracil dose reduced by 20%. If WBC remains < 2500/mm³ for over 10 days despite deferring fluorouracil, discontinue administration of ERGAMISOL. Both drugs should be deferred unless platelets are adequate ($\geq 100,000/\text{mm}^3$).

ERGAMISOL should not be used at doses exceeding the recommended dose or frequency. Clinical studies suggest a relationship between ERGAMISOL adverse experiences and increasing dose, and since some of these, e.g. agranulocytosis, may be life-threatening, the recommended dosage regimen should not be exceeded (see "WARNINGS"). Before beginning this combination adjuvant treatment, the physician should become familiar with the labeling for fluorouracil.

HOW SUPPLIED

ERGAMISOL (levamisole hydrochloride) is available in white, coated tablets containing the equivalent of 50 mg of levamisole base, debossed "JANSSEN" and "L"/"50". They are supplied in blister packages of 36 tablets (NDC 50458-270-36).

Store at room temperature, 15°-30°C (59°-86°F).
Protect from moisture.

Adverse experience	ERGAMISOL	ERGAMISOL
	N = 440 %	plus fluorouracil N = 599 %
Gastrointestinal		
Nausea	22	65
Diarrhea	13	52
Stomatitis	3	39
Vomiting	6	20
Anorexia	2	6
Abdominal pain	2	5
Constipation	2	3
Flatulence	<1	2
Dyspepsia	<1	1
Hematological		
Leukopenia		
< 2000/mm ³	<1	1
≥ 2000 to < 4000/mm ³	4	19
≥ 4000/mm ³	2	33
unscored category	0	<1
Thrombocytopenia		
< 50,000/mm ³	0	0
≥ 50,000 to < 130,000/mm ³	1	8
≥ 130,000/mm ³	1	10
Anemia	0	6
Granulocytopenia	<1	2
Epistaxis	0	1
Skin and Appendages		
Dermatitis	8	23
Alopecia	3	22
Pruritus	1	2
Skin discoloration	0	2
Urticaria	<1	0
Body as a Whole		
Fatigue	6	11
Fever	3	5
Rigors	3	5
Chest pain	<1	1
Edema	1	1
Resistance Mechanisms		
Infection	5	12
Special Senses		
Taste Perversion	8	8
Altered sense of smell	1	1
Musculoskeletal System		
Arthralgia	5	4
Myalgia	3	2
Central and peripheral nervous system		
Dizziness	3	4
Headache	3	4
Paresthesia	2	3
Ataxia	0	2
Psychiatric		
Somnolence	3	2
Depression	1	2
Nervousness	1	2
Insomnia	1	1
Anxiety	1	1
Forgetfulness	0	1
Vision		
Abnormal tearing	0	4
Blurred vision	1	2
Conjunctivitis	<1	2
Liver and biliary system		
Hyperbilirubinemia	<1	1

REFERENCES

1. Laurie JA, Moertel CG, Fleming TR, et al. Surgical adjuvant therapy of large-bowel carcinoma: An evaluation of levamisole and the combination of levamisole and fluorouracil. *J Clin Oncol* 1989; 7:1447-1456.
2. Moertel CG, Fleming TR, Macdonald JS, et al. Levamisole and fluorouracil for adjuvant therapy of resected colon carcinoma. *New Engl J Med* 1990; 322:352-358.
3. Data on file, Janssen Pharmaceutica Inc.

Manufactured by:

Janssen Pharmaceutica, nv

Beerse, Belgium

Distributed by:

Janssen Pharmaceutica Inc.

Titusville, NJ 08560

Edition January 1993, February 1993

U.S. Patent Number 4,584,305

Shown in Product Identification Section, page 312

HISMANAL®

[his-'ma-nal]
(astemizole) Tablets

DESCRIPTION

HISMANAL® (astemizole) is a histamine H₁-receptor antagonist available in scored white tablets for oral use. Each tablet contains 10 mg of astemizole, and, as inactive ingredients: lactose, cornstarch, microcrystalline cellulose, pregelatinized starch, povidone K90, magnesium stearate, colloidal silicon dioxide, and sodium lauryl sulfate. Astemizole is chemically designated as 1-[(4-fluorophenyl)methyl]-N-[1-(2-(4-methoxyphenyl)ethyl)-4-piperidinyl]-1H-benzimidazol-2-amine, with a molecular weight of 458.58. The empirical formula is C₂₂H₂₁FN₂O. Astemizole is a white to slightly off-white powder; it is insoluble in water, slightly soluble in ethanol and soluble in chloroform and methanol.

CLINICAL PHARMACOLOGY

HISMANAL is a long-acting, selective histamine H₁-receptor antagonist. Receptor binding studies in animals demonstrated that at pharmacological doses, HISMANAL occupies peripheral H₁-receptors but does not reach H₁-receptors in the brain. Whole body autoradiographic studies in rats, radiolabel tissue distribution studies in dogs and radioligand binding studies of guinea pig brain H₁-receptors have shown that HISMANAL does not readily cross the blood-brain barrier. Screening studies in rats at effective antihistaminic doses showed no anticholinergic effects. Studies in humans using the recommended dosage regimens have not been performed to determine whether HISMANAL is associated with a different frequency of anticholinergic effects than therapeutic doses of other antihistamines.

The absorption of HISMANAL is reduced by 60% when taken with meals. In single oral dose studies, HISMANAL was rapidly absorbed from the gastrointestinal tract; peak plasma concentrations of unchanged HISMANAL were reached within one hour. Due to extensive first pass metabolism and significant tissue distribution, plasma concentrations of unchanged drug were low. Elimination of unchanged HISMANAL occurred with a half-life of approximately one day. Elimination of HISMANAL plus hydroxylated metabolites, considered together to represent the pharmacologically active fraction in plasma, was biphasic with half-lives of 20 hours for the distribution phase and 7-11 days for the elimination phase. The pharmacokinetics of HISMANAL plus hydroxylated metabolites are dose proportional following single doses of 10 to 30 mg.

Following chronic administration, steady state plasma concentrations of HISMANAL plus hydroxylated metabolites (mainly desmethylastemizole) were reached within four to eight weeks; concentrations of the metabolites are substantially higher than those of unchanged HISMANAL. HISMANAL plus hydroxylated metabolites decayed biphasically with an initial half-life of 7-9 days, with plasma concentrations being reduced by 75% within this phase, and with a terminal half-life of about 19 days. The initial phase (t_{1/2} = 7-9 days) appears to determine the time to reach steady state plasma concentrations of HISMANAL plus hydroxylated metabolites. Steady state plasma concentrations of unchanged HISMANAL were reached by 6 days (with a range of 6-8 days); unchanged HISMANAL was eliminated from plasma with a half-life of approximately 2 days (with a range of 1-2.5 days).

Excretion and metabolism studies with ¹⁴C-labeled HISMANAL in volunteers demonstrated that the drug is

almost completely metabolized in the liver and primarily excreted in the feces.

Interpatient variability in pharmacokinetic parameters may be greater in patients with liver disease as compared to normal subjects. Systematic evaluation of the pharmacokinetics in patients with hepatic or renal dysfunction has not been performed.

The in-vitro plasma protein binding of unchanged HISMANAL (100 ng/mL) was 96.7% with 2.3% being found as free drug in the plasma water. In human blood with an astemizole concentration of 100 ng/mL, 81.5% of astemizole was bound to the plasma proteins, with 36.2% being distributed to the blood cell fraction. The concentration of astemizole found in the blood was the same as that found in the plasma fraction of the blood. Binding studies for the astemizole metabolite(s) which achieve much higher concentrations than astemizole under chronic dosing conditions have not been conducted.

INDICATIONS AND USAGE

HISMANAL tablets are indicated for the relief of symptoms associated with seasonal allergic rhinitis and chronic idiopathic urticaria. HISMANAL should not be used as a p r n product for immediate relief of symptoms. Patients should be advised not to increase the dose in an attempt to accelerate the onset of action.

Clinical studies have not been conducted to evaluate the effectiveness of HISMANAL in the common cold.

CONTRAINDICATIONS

CONCOMITANT ADMINISTRATION OF ASTEMIZOLE WITH ERYTHROMYCIN IS CONTRAINDICATED BECAUSE ERYTHROMYCIN IS KNOWN TO IMPAIR THE CYTOCHROME P450 ENZYME SYSTEM WHICH ALSO INFLUENCES ASTEMIZOLE METABOLISM. THERE HAVE BEEN TWO REPORTS TO DATE OF SYNCOPE WITH TORSADES DE POINTES, REQUIRING HOSPITALIZATION, IN PATIENTS TAKING COMBINATIONS OF HISMANAL 10 MG DAILY WITH ERYTHROMYCIN. IN EACH CASE THE QT INTERVALS WERE PROLONGED BEYOND 650 MILLISECONDS AT THE TIME OF THE EVENT; ONE PATIENT ALSO RECEIVED KETOCONAZOLE AND THE OTHER PATIENT ALSO HAD HYPOKALEMIA.

CONCOMITANT ADMINISTRATION OF ASTEMIZOLE WITH KETOCONAZOLE TABLETS IS CONTRAINDICATED BECAUSE AVAILABLE HUMAN PHARMACOKINETIC DATA INDICATE THAT ORAL KETOCONAZOLE SIGNIFICANTLY INHIBITS THE METABOLISM OF ASTEMIZOLE, RESULTING IN ELEVATED PLASMA LEVELS OF ASTEMIZOLE AND DESMETHYLASTEMIZOLE. DATA SUGGEST THAT CARDIOVASCULAR EVENTS ARE ASSOCIATED WITH ELEVATION OF ASTEMIZOLE AND/OR ASTEMIZOLE METABOLITE LEVELS, RESULTING IN ELECTROCARDIOGRAPHIC QT PROLONGATION.

CONCOMITANT ADMINISTRATION OF ASTEMIZOLE WITH ITRACONAZOLE IS ALSO CONTRAINDICATED BASED ON THE CHEMICAL RESEMBLANCE OF ITRACONAZOLE AND KETOCONAZOLE. IN-VITRO DATA SUGGEST THAT ITRACONAZOLE HAS A LESS PRONOUNCED EFFECT ON THE BIOTRANSFORMATION SYSTEM RESPONSIBLE FOR THE METABOLISM OF ASTEMIZOLE COMPARED TO KETOCONAZOLE. (See WARNINGS and PRECAUTIONS: Drug Interactions.)

HISMANAL is contraindicated in patients with known hypersensitivity to astemizole or any of the inactive ingredients.

WARNINGS

QT PROLONGATION/VENTRICULAR ARRHYTHMIAS

RARE CASES OF SERIOUS CARDIOVASCULAR ADVERSE EVENTS INCLUDING DEATH, CARDIAC ARREST, QT PROLONGATION, TORSADES DE POINTES, AND OTHER VENTRICULAR ARRHYTHMIAS HAVE BEEN OBSERVED IN PATIENTS EXCEEDING RECOMMENDED DOSES OF ASTEMIZOLE. WHILE THE MAJORITY OF SUCH EVENTS HAVE OCCURRED FOLLOWING SUBSTANTIAL OVERDOSES OF ASTEMIZOLE, TORSADES DE POINTES (ARRHYTHMIAS) HAVE VERY RARELY OCCURRED AT REPORTED DOSES AS LOW AS 20-30 MG DAILY (2-3 TIMES THE RECOMMENDED DAILY DOSE). DATA SUGGEST THAT THESE EVENTS ARE ASSOCIATED WITH ELEVATION OF ASTEMIZOLE AND/OR ASTEMIZOLE METABOLITE LEVELS, RESULTING IN ELECTROCARDIOGRAPHIC QT PROLONGATION. THESE EVENTS HAVE ALSO OCCURRED AT 10 MG DAILY IN A FEW PATIENTS WITH POSSIBLE AGGRAVATING CIRCUMSTANCES (SEE CONTRAINDICATIONS, AND WARNING PARAGRAPHS BELOW WARNINGS BOX IN VIEW OF THE POTENTIAL FOR

CARDIAC ARRHYTHMIAS. ADHERENCE TO THE RECOMMENDED DOSE SHOULD BE EMPHASIZED. DO NOT EXCEED THE RECOMMENDED DOSE OF 10 MG (ONE TABLET) DAILY.

SOME PATIENTS APPEAR TO INCREASE THE DOSE OF HISMANAL IN AN ATTEMPT TO ACCELERATE THE ONSET OF ACTION. PATIENTS SHOULD BE ADVISED NOT TO DO THIS AND NOT TO USE HISMANAL AS A P R N PRODUCT FOR IMMEDIATE RELIEF OF SYMPTOMS.

CONCOMITANT ADMINISTRATION OF ASTEMIZOLE WITH KETOCONAZOLE TABLETS, ITRACONAZOLE OR ERYTHROMYCIN IS CONTRAINDICATED. (SEE CONTRAINDICATIONS AND PRECAUTIONS: DRUG INTERACTIONS.)

SINCE ASTEMIZOLE IS EXTENSIVELY METABOLIZED BY THE LIVER, THE USE OF ASTEMIZOLE IN PATIENTS WITH SIGNIFICANT HEPATIC DYSFUNCTION SHOULD GENERALLY BE AVOIDED.

IN SOME CASES, SEVERE ARRHYTHMIAS HAVE BEEN PRECEDED BY EPISODES OF SYNCOPE. SYNCOPE IN PATIENTS RECEIVING ASTEMIZOLE SHOULD LEAD TO IMMEDIATE DISCONTINUATION OF TREATMENT AND APPROPRIATE CLINICAL EVALUATION, INCLUDING ELECTROCARDIOGRAPHIC TESTING (LOOKING FOR QT PROLONGATION AND VENTRICULAR ARRHYTHMIA). (SEE CLINICAL PHARMACOLOGY, CONTRAINDICATIONS, WARNINGS, PRECAUTIONS, AND DOSAGE AND ADMINISTRATION.)

Patients known to have conditions leading to QT prolongation may experience QT prolongation and/or ventricular arrhythmia with astemizole at recommended doses. The effect of astemizole in patients who are receiving agents which alter the QT interval is unknown. However, in view of astemizole's known potential for QT prolongation, it is advisable to avoid its use in patients with QT prolongation syndrome or who are taking medications which are reported to prolong QT intervals (including procainolol, certain antiarrhythmics, certain tricyclic antidepressants, certain phenothiazines, certain calcium channel blockers such as bepridil, and terfenadine), patients with electrolyte abnormalities such as hypokalemia or hypomagnesemia, or those taking diuretics with potential for inducing electrolyte abnormalities.

Rare cases of cardiovascular events have been observed in patients with hepatic dysfunction. Systematic evaluation of the pharmacokinetics of astemizole in patients with hepatic dysfunction has not been performed. Since astemizole is extensively metabolized by the liver, the use of HISMANAL in patients with significant hepatic dysfunction should generally be avoided.

PRECAUTIONS

General:

Caution should be given to potential anticholinergic (drying effects) in patients with lower airway diseases.

Caution should be used in patients with cirrhosis or other liver diseases. (See CLINICAL PHARMACOLOGY section.) HISMANAL does not appear to be dialyzable.

Caution should also be used when treating patients with renal impairment.

Drug Interactions:

See CONTRAINDICATIONS and WARNINGS sections for discussion of information regarding potential drug interactions.

Ketoconazole/Itraconazole

Concomitant administration of ketoconazole tablets or itraconazole with astemizole is contraindicated. (See CONTRAINDICATIONS and WARNINGS BOX.)

Due to the chemical similarity of fluconazole, metronidazole, and miconazole i.v. to ketoconazole, concomitant use of these products with astemizole is not recommended.

Macrolides (including erythromycin)

Concomitant administration of erythromycin with astemizole is contraindicated. (See CONTRAINDICATIONS and WARNINGS BOX.) Concomitant administration of astemizole with other macrolide antibiotics, including troleandomycin, azithromycin, and clarithromycin, is not recommended.

Information for Patients:

Patients taking HISMANAL should receive the following information and instructions. Antihistamines are prescribed to reduce allergic symptoms. Patients taking HISMANAL should be advised 1) to adhere to the recommended dose, and 2) that the use of excessive doses may lead to serious cardiovascular events. Some patients appear to increase the dose of HISMANAL in an attempt to accelerate the onset of action. PATIENTS SHOULD BE ADVISED NOT TO DO THIS and not to use HISMANAL as a p r n product for immediate relief of symptoms. Patients should be questioned about use of any other prescription or over-the-counter medication; and should be cautioned regarding the potential for life-threatening arrhythmias with concurrent use of ketoconazole, itraconazole, or erythromycin. Patients should be advised to

consult the physician before concurrent use of other medications with astemizole. Patients should be questioned about pregnancy or lactation before starting HISMANAL therapy, since the drug should be used in pregnancy or lactation only if the potential benefit justifies the potential risk to fetus or baby. (See Pregnancy subsection.) In addition, patients should be instructed to take HISMANAL on an empty stomach, e.g., at least 2 hours after a meal. No additional food should be taken for at least 1 hour after dosing. Patients should also be instructed to store this medication in a tightly closed container in a cool, dry place, away from heat or direct sunlight, and away from children.

Carcinogenesis, Mutagenesis, Impairment of Fertility:

Carcinogenic potential has not been revealed in rats given 260x the recommended human dose of astemizole for 24 months, or in mice given 400x the recommended human dose for 18 months. Micronucleus, dominant lethal, sister chromatid exchange and Ames tests of astemizole have not revealed mutagenic activity.

Impairment of fertility was not observed in male or female rats given 200x the recommended human dose.

Pregnancy: Pregnancy Category C:

Teratogenic effects were not observed in rats administered 200x the recommended human dose or in rabbits given 200x the recommended human dose. Maternal toxicity was seen in rabbits administered 200x the recommended human dose. Embryocidal effects accompanied by maternal toxicity were observed at 100x the recommended human dose in rats. Embryotoxicity or maternal toxicity was not observed in rats or rabbits administered 60x the recommended human dose. There are no adequate and well-controlled studies in pregnant women. HISMANAL should be used during pregnancy only if the potential benefit justifies the potential risk to the fetus. Metabolites may remain in the body for as long as 4 months after the end of dosing, calculated on the basis of 6 times the terminal half-life. (See CLINICAL PHARMACOLOGY section.)

Nursing Mothers:

It is not known whether this drug is excreted in human milk. Because certain drugs are known to be excreted in human milk, caution should be exercised when HISMANAL is administered to a nursing woman: HISMANAL is excreted in the milk of dogs.

Pediatric Use:

Safety and efficacy in children under 12 years of age has not been demonstrated.

ADVERSE REACTIONS

For information regarding cardiovascular adverse events (e.g. cardiac arrest, ventricular arrhythmias), please see CONTRAINDICATIONS and WARNINGS BOX. In some cases, recognition of severe arrhythmias has been preceded by episodes of syncope. Similarly, rare cases of hypotension, palpitations, and dizziness have also been reported with HISMANAL use, which may reflect undetected ventricular arrhythmia.

The reported incidences of adverse reactions listed in the following table are derived from controlled clinical studies in adults. In these studies the usual maintenance dose of HISMANAL was 10 mg once daily.

(See table on next page.)

Adverse reaction information has been obtained from more than 7500 patients in all clinical trials. Weight gain has been reported in 3.6% of astemizole treated patients involved in controlled studies, with an average treatment duration of 53 days. In 46 of the 69 patients for whom actual weight gain data was available, the average weight gain was 3.2 kg. Less frequently occurring adverse experiences reported in clinical trials or spontaneously from marketing experience with HISMANAL include: angioedema, asymptomatic liver enzyme elevations, bronchospasm, depression, edema, epistaxis, hepatitis, myalgia, palpitation, paresthesia, photosensitivity, pruritus, and rash.

Marketing experiences include isolated cases of convulsions. A causal relationship with HISMANAL has not been established.

OVERDOSEAGE

In the event of overdose, supportive measures including gastric lavage and emesis should be employed. Substantial overdoses of HISMANAL can cause death, cardiac arrest, QT prolongation, torsades de pointes, and other ventricular arrhythmias. These events can also occur, although rarely, at doses (20-30 mg) close to the recommended dose (10 mg/daily). (See WARNINGS BOX and DOSAGE AND ADMINISTRATION.)

Seizures and syncope have also been reported with overdose and may be associated with a cardiac event. Overdose patients should be carefully monitored as long as the QT interval is prolonged or arrhythmias are present. In some cases, this has been up to six days. In overdose cases in which ventricular arrhythmias are associated with significant QT prolongation, treatment with antiarrhythmics

Continued on next page

Janssen Pharmaceutica—Cont.

Percent of Patients Reporting

ADVERSE EVENT	Controlled Studies*		
	HISMANAL (N=1630) %	PLACEBO (N=1109) %	CLASSICAL** (N=304) %
Central Nervous System			
Drowsiness	7.1	6.4	22.0
Headache	6.7	9.2	3.3
Fatigue	4.2	1.6	11.8
Appetite increase	3.9	1.4	0.0
Weight increase	3.6	0.7	1.0
Nervousness	2.1	1.2	0.3
Dizzy	2.0	1.8	1.0
Gastrointestinal System			
Nausea	2.5	2.9	1.3
Diarrhea	1.8	2.0	0.7
Abdominal pain	1.4	1.2	0.7
Eye, Ear, Nose, and Throat			
Mouth dry	5.2	3.8	7.9
Pharyngitis	1.7	2.3	0.3
Conjunctivitis	1.2	1.2	0.7
Other			
Arthralgia	1.2	1.6	0.0

*Duration of treatment in Controlled Studies ranged from 7 to 182 Days

**Classical Drugs: Clemastine (N=137); Chlorpheniramine (N=100); Pheniramine Maleate (N=47); d-Chlorpheniramine (N=20)

known to prolong QT intervals is not recommended. HISMANAL does not appear to be dialyzable. Oral LD₅₀ values for HISMANAL were 2052 mg/kg in mice and 3154 mg/kg in rats. In neonatal rats, the oral LD₅₀ was 905 mg/kg in males and 1235 mg/kg in females.

DOSAGE AND ADMINISTRATION

The recommended dosage for adults and children 12 years of age and older is 10 mg (1 tablet) once daily.

DO NOT EXCEED THE RECOMMENDED DOSE. Patients should be advised not to increase the dose of HISMANAL in an attempt to accelerate the onset of action. (See WARNINGS BOX.) USE OF HISMANAL IN PATIENTS TAKING KETOCONAZOLE, ITRACONAZOLE, OR ERYTHROMYCIN IS CONTRAINDICATED. (See CONTRAINDICATIONS, WARNINGS, and PRECAUTIONS: Drug Interactions.)

Studies evaluating the need for dosage adjustments for patients with hepatic or renal dysfunction have not been performed. Since astemizole is extensively metabolized by the liver, use of HISMANAL in patients with significant hepatic dysfunction should generally be avoided.

HISMANAL should be taken on an empty stomach, e.g., at least two hours after a meal. There should be no additional food intake for at least one hour post-dosing.

HOW SUPPLIED

HISMANAL is available as white, scored tablets containing 10 mg of astemizole debossed "JANSSEN" and on the reverse side debossed "AST₁₀".

NDC 50458-510-10

(100 tablets)

Store tablets at room temperature (59°–86°F) (15°–30°C). Protect from moisture.

U.S. Patent 4,219,559

Revised February 1992, October 1992

JANSSEN PHARMACEUTICA INC.

Titurnville, New Jersey 08560-0200

Shown in Product Identification Section, page 312

IMODIUM®

(loperamide HCl) Capsules

DESCRIPTION

IMODIUM (loperamide hydrochloride), 4-(p-chlorophenyl)-4-hydroxy-N, N-dimethyl-α,α-diphenyl-1-piperidinebutyramide monohydrochloride, is a synthetic antidiarrheal for oral use.

IMODIUM is available in 2 mg capsules.

The inactive ingredients are:

Lactose, croscarmellose, talc, and magnesium stearate.

IMODIUM capsules contain F D & C Yellow No. 6.

CLINICAL PHARMACOLOGY

In vitro and animal studies show that IMODIUM acts by slowing intestinal motility and by affecting water and electrolyte movement through the bowel. IMODIUM inhibits peristaltic activity by a direct effect on the circular and longitudinal muscles of the intestinal wall.

In man, IMODIUM prolongs the transit time of the intestinal contents. It reduces the daily fecal volume, increases the

viscosity and bulk density, and diminishes the loss of fluid and electrolytes. Tolerance to the antidiarrheal effect has not been observed.

Clinical studies have indicated that the apparent elimination half-life of loperamide in man is 10.8 hours with a range of 9.1–14.4 hours. Plasma levels of unchanged drug remain below 2 nanograms per ml after the intake of a 2 mg capsule of IMODIUM. Plasma levels are highest approximately five hours after administration of the capsule and 2.5 hours after the liquid. The peak plasma levels of loperamide were similar for both formulations. Of the total excreted in urine and feces, most of the administered drug was excreted in feces. In those patients in whom biochemical and hematological parameters were monitored during clinical trials, no trends toward abnormality during IMODIUM therapy were noted. Similarly, urinalyses, EKG and clinical ophthalmological examinations did not show trends toward abnormality.

INDICATIONS AND USAGE

IMODIUM is indicated for the control and symptomatic relief of acute nonspecific diarrhea and of chronic diarrhea associated with inflammatory bowel disease. IMODIUM is also indicated for reducing the volume of discharge from ileostomies.

CONTRAINDICATIONS

IMODIUM is contraindicated in patients with known hypersensitivity to the drug and in those in whom constipation must be avoided.

WARNINGS

IMODIUM should not be used in the case of acute dysentery, which is characterized by blood in stools and high fever. Fluid and electrolyte depletion often occur in patients who have diarrhea. In such cases, administration of appropriate fluid and electrolytes is very important. The use of IMODIUM does not preclude the need for appropriate fluid and electrolyte therapy.

In some patients with acute ulcerative colitis, and in pseudomembranous colitis associated with broad-spectrum antibiotics, agents which inhibit intestinal motility or delay intestinal transit time have been reported to induce toxic megacolon. IMODIUM therapy should be discontinued promptly if abdominal distention, constipation, or ileus occurs.

IMODIUM should be used with special caution in young children because of the greater variability of response in this age group. Dehydration, particularly in younger children, may further influence the variability of response to IMODIUM.

PRECAUTIONS

General: In acute diarrhea, if clinical improvement is not observed in 48 hours, the administration of IMODIUM should be discontinued.

Patients with hepatic dysfunction should be monitored closely for signs of CNS toxicity because of the apparent large first pass biotransformation.

Information for Patients: Patients should be advised to check with their physician if their diarrhea does not improve after a couple of days or if they note blood in their stools or develop a fever.

Drug Interactions: There was no evidence in clinical trials of drug interactions with concurrent medications. Carcinogenesis, mutagenesis, impairment of fertility: In an 18-month rat study with doses up to 133 times the maximum

human dose (on a mg/kg basis), there was no evidence of carcinogenesis. Mutagenicity studies were not conducted. Reproduction studies in rats indicated that high doses (180–200 times the human dose) could cause marked female infertility and reduced male fertility.

Pregnancy

Teratogenic Effects

Pregnancy Category B: Reproduction studies in rats and rabbits have revealed no evidence of impaired fertility or harm to the fetus at doses up to 30 times the human dose. Higher doses impaired the survival of mothers and nursing young. The studies offered no evidence of teratogenic activity. There are, however, no adequate and well controlled studies in pregnant women. Because animal reproduction studies are not always predictive of human response, this drug should be used during pregnancy only if clearly needed.

Nursing Mothers: It is not known whether this drug is excreted in human milk. Because many drugs are excreted in human milk, caution should be exercised when IMODIUM is administered to a nursing woman.

Pediatric Use: See the "Warnings" Section for information on the greater variability of response in this age group.

In case of accidental overdose of IMODIUM by children, see "Overdose" Section for suggested treatment.

ADVERSE REACTIONS

The adverse effects reported during clinical investigations of IMODIUM are difficult to distinguish from symptoms associated with the diarrheal syndrome. Adverse experiences recorded during clinical studies with IMODIUM were generally of a minor and self-limiting nature. They were more commonly observed during the treatment of chronic diarrhea.

The following patient complaints have been reported and are listed in decreasing order of frequency with the exception of hypersensitivity reactions which is listed first since it may be the most serious.

- Hypersensitivity reactions (including skin rash) have been reported with IMODIUM use.
- Abdominal pain, distention or discomfort
- Nausea and vomiting
- Constipation
- Tiredness
- Drowsiness or dizziness
- Dry mouth

In postmarketing experiences, there have been rare reports of paralytic ileus associated with abdominal distention. Most of these reports occurred in the setting of acute dysentery, overdose, and with very young children of less than two years of age.

DRUG ABUSE AND DEPENDENCE

Abuse: A specific clinical study designed to assess the abuse potential of loperamide at high doses resulted in a finding of extremely low abuse potential.

Dependence: Studies in morphine-dependent monkeys demonstrated that loperamide hydrochloride at doses above those recommended for humans prevented signs of morphine withdrawal. However, in humans, the naloxone challenge pupil test, which when positive indicates opiate-like effects, performed after a single high dose, or after more than two years of therapeutic use of IMODIUM, was negative. Orally administered IMODIUM (loperamide formulated with magnesium stearate) is both highly insoluble and penetrates the CNS poorly.

OVERDOSAGE

In case of overdose, paralytic ileus and CNS depression may occur. Children may be more sensitive to CNS effects than adults. Clinical trials have demonstrated that a slurry of activated charcoal administered promptly after ingestion of loperamide hydrochloride can reduce the amount of drug which is absorbed into the systemic circulation by as much as ninefold. If vomiting occurs spontaneously upon ingestion, a slurry of 100 gms of activated charcoal should be administered orally as soon as fluids can be retained.

If vomiting has not occurred, gastric lavage should be performed followed by administration of 100 gms of the activated charcoal slurry through the gastric tube. In the event of overdose, patients should be monitored for signs of CNS depression for at least 24 hours. Children may be more sensitive to central nervous system effects than adults. If CNS depression is observed, naloxone may be administered. If responsive to naloxone, vital signs must be monitored carefully for recurrence of symptoms of drug overdose for at least 24 hours after the last dose of naloxone.

In view of the prolonged action of loperamide and the short duration (one to three hours) of naloxone, the patient must be monitored closely and treated repeatedly with naloxone as indicated. Since relatively little drug is excreted in the urine, forced diuresis is not expected to be effective for IMODIUM overdose.

In clinical trials an adult who took three 20 mg doses within a 24 hour period was nauseated after the second dose and vomited after the third dose. In studies designed to examine the potential for side effects, intentional ingestion of up to 60

EXHIBIT D

Warnings Issued on Nonsedating Antihistamines Terfenadine and Astemizole:

Terfenadine: Health professionals have been notified by Mailgram that a box warning and contraindications have been added to the labeling for terfenadine antihistamine products, Seldane and Seldane-D (Marion Merrell Dow Inc, Kansas City, Mo), regarding new information on the risk of serious cardiovascular events in patients taking terfenadine.

The warning states that rare cases of serious cardiovascular adverse events, including death, cardiac arrest, torsades de pointes, and other ventricular arrhythmias, have occurred in the following clinical settings, frequently in association with increased terfenadine levels, which lead to electrocardiographic QT prolongation: (1) concomitant administration of ketoconazole (Nizoral, Janssen Pharmaceutica Inc, Piscataway, NJ); (2) overdose, including single doses as low as 360 mg; (3) concomitant use of erythromycin; and (4) significant hepatic dysfunction.

It states that terfenadine is contraindicated in patients taking ketoconazole or erythromycin and in patients with significant hepatic dysfunction and that the recommended dose should not be exceeded. And in some cases, severe arrhythmias have been preceded by episodes of syncope. Syncope in patients receiving terfenadine should lead to discontinuation of treatment and full evaluation of potential arrhythmias.

Rare reports of serious cardiovascular adverse events have been received, some involving QT prolongation and torsades de pointes, in apparently normal individuals without identifiable risk factors. There is no conclusive evidence of a causal relationship of these events with terfenadine, and further studies of this are being undertaken.

Physicians are advised to discuss the potential risk of serious cardiovascular events and specific risk factors with patients, and to refrain from prescribing Seldane to patients with these risk factors. The sponsor has been asked to de-

velop a patient leaflet for immediate use and unit-of-use packaging that will include the leaflet.

Astemizole: Health professionals have also been notified about a box warning, dosing recommendation change, and other information added to the astemizole (Hismanal, Janssen Pharmaceutica Inc, Piscataway, NJ) labeling to warn about the potential for serious adverse cardiovascular events in patients exceeding recommended doses of the drug. While the majority of such events have occurred following substantial overdoses, torsades de pointes (arrhythmia) has very rarely occurred at reported doses as low as 20 mg to 30 mg daily. Therefore, the new labeling highlights that *the recommended doses (10 mg daily) should not be exceeded*; a larger dose during the first several days of treatment is no longer recommended as this may suggest to patients that such doses may be used chronically. It is important to stress to patients that they should adhere to the recommended dose and that excessive doses may lead to serious cardiovascular events. Some patients appear to increase the dose of astemizole in an attempt to accelerate the onset of action. Patients should be advised not to do this and not to use astemizole as a PRN (*pro re nata*) product for immediate relief of symptoms.

Syncope in patients receiving astemizole should lead to immediate discontinuation of treatment and appropriate clinical evaluation, including electrocardiographic testing.

Zalcitabine Approved for Use in Combination With Zidovudine for HIV Infection: The FDA has approved zalcitabine, formerly known as dideoxycytidine or ddC, for use in treating human immunodeficiency virus (HIV) infection. The drug product (HIVID, Hoffmann-LaRoche Inc, Nutley, NJ) is indicated for use in combination with zidovudine, known as AZT (Retrovir, formerly Burroughs Wellcome Co, Research Triangle Park, NC), as a treatment option for adult patients with advanced HIV in-

fection ($CD4^+$ cell count $\leq 300/mm^3$ [$\leq 0.30 \times 10^9/L$]) who show signs of clinical or immunological deterioration.

The approved indication is based on limited data from two small studies in which patients treated with combination therapy had a greater $CD4^+$ cell response than those who received zidovudine alone. In both studies all patients were zidovudine-naïve. At present, no data are available on the combined use of zalcitabine and zidovudine in patients who have previously used zidovudine monotherapy. The studies were not designed to measure the clinical efficacy of the combination.

Currently there are no data demonstrating enhanced survival, lowered incidence of opportunistic infections, or decreased progression of HIV infection for patients treated with combination therapy, although four studies investigating clinical benefit of the therapy are ongoing. Because zidovudine has been shown to prolong survival and decrease the incidence of infection in patients with advanced HIV disease, zidovudine monotherapy should be considered as initial therapy for adult patients with advanced HIV infection who have evidence of impaired immunity ($CD4^+$ cell count of $\leq 500/mm^3$ [$\leq 0.50 \times 10^9/L$]).

The major clinical toxic effects of zalcitabine are peripheral neuropathy and, much less frequently, pancreatitis. Toxic effects previously associated with zidovudine monotherapy are also likely to occur with the combination therapy.

The approval of zalcitabine is the first to occur under the principles and procedures of the FDA's accelerated drug review policy (JAMA. 1992;267:3262), which also provides for prompt removal of the product from the market if further review determines that it is ineffective.

—by Stuart L. Nightingale, MD
Associate Commissioner
for Health Affairs

Editor's Note: Written inquiries may be directed to the Office of Health Affairs, FDA, Parklawn Building, 5600 Fishers Ln, Rockville, MD 20857.